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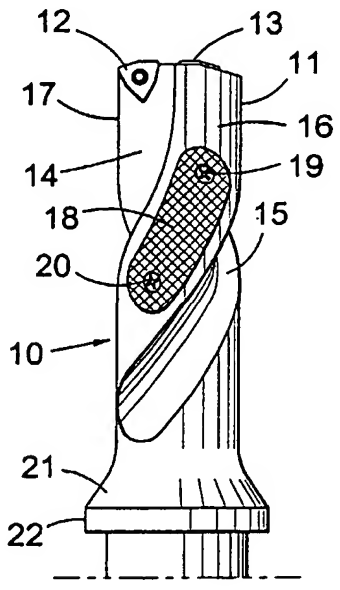
(54) Title: TOOL FOR MACHINING OF METALS WITH VIBRATION DAMPING MEANS



(57) Abstract: The invention relates to a tool for working in metallic materials, comprising a tool body (11) having located in its front end at least one cutting insert (12), wherein the tool body is provided with one or several damping elements (18). Characteristic thereof is that the space between the damping element (18) and the tool body (11) is arranged such relative to one/each other that, during machining, a relative movement of the tool body (11) and the damping element (18) is allowed.

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Tool for machining of metals with vibration damping means.

TECHNICAL FIELD

The present invention relates to a drilling tool for working in metallic material, more precisely a tool of the type that comprises a tool body having at least one cutting insert exposed for working a workpiece. The tool may e.g. be formed as a drill having flutes extending in its longitudinal direction, which flutes join to the outer and inner inserts, respectively, in order to serve as grooves for chip release.

The present invention also relates to a damping device adapted to be arranged at a tool body.

At working of holes in metallic materials, problems arise with the high sound level caused by vibrations from the working and the machine sound. Hitherto used drills have not been provided with built-in/added damping devices formed in such a way that a suitable sound and vibration damping has been feasible. The essential thing is to be able to eliminate major parts of the vibration sound in the range that is uncomfortable to the ear. If possible, only the machine sound as well as the inevitable chip rattle which normally usually amounts to 74-76 dB should be left. However, without damping it is not uncommon that levels up to 130 dB have been measured. The proper machine sound feels more restful to the ear.

By SE-B-468 930 it is, for instance, previously known to form a drilling tool with a partly vibration damping material, which has been applied in the flute of the drill's chip channels formed in the longitudinal direction. However, the hard metal borders applied according to SE-B-468 930 have not turned out to give any suitable silencing of noise.

SUMMARY OF THE INVENTION

In these circumstances, the aim of the invention is to provide a solution to the above-mentioned problem. According to the

invention, a tool is provided for chip-working machining of metallic materials, comprising a holder body, supporting at least one cutting insert for active milling of a workpiece, wherein the holder body is provided with at least one damping element of another or the same material as the holder body. The tool has in its front end a portion provided with a cutting insert. The damping element and the holder body are arranged in relation to one another such that during machining, a relative movement of the holder body and the damping element is allowed.

It has also been solved by a damping device adapted to be arranged at a tool with a holder body provided in its front end with cutting insert. The damping device is shaped as an annular member, releasably or non-releasably connected to the holder body.

Hereby is achieved an apparatus for a tool with substantially improved sound and vibration damping which is useful at drilling as well as at milling or e.g. interior lathing. As a result of this, the new tool permits a substantial reduction of the sound level caused by the proper metal working of the workpiece. At the same time, such a tool becomes less sensitive to vibrations, which arise by virtue of variations of the cutting forces.

DRAWING SUMMARY

Below, the invention will be described closer in connection with two embodiment examples of the invention illustrated in the drawings, where

Fig. 1 shows a side view of a first embodiment of the tool;
Fig. 2 shows a side view of a second embodiment of the tool;
Fig. 3A shows a side view of a third embodiment of the tool;
Fig. 3B shows a side view of a fourth embodiment of the tool;
Fig. 3C shows an end view of the embodiment of Fig. 3B;
Fig. 4 shows a side view of a fifth embodiment of the tool;
Fig. 5 shows a side view of a sixth embodiment of the tool;
Fig. 6 shows a side view of a seventh embodiment of the tool;
Fig. 7 shows an end view of the embodiment of Fig. 6;
Fig. 8 shows a side view of another embodiment;

Fig. 9 shows a cross-section along the line A-A of a drill according to Fig. 8;

Fig. 10 shows an alternative embodiment;

Fig. 11A also shows an alternative embodiment;

Fig. 11B shows an end view of Fig. 11A;

Fig. 12A shows another alternative embodiment;

Fig. 12B shows an end view of Fig. 12A;

Fig. 13 shows a milling tool according to the invention;

Fig. 14 shows a side view of a turning bar according to the invention;

Figs. 15A-15B show a drilling tool according to the invention;

Figs. 16A-16B show another embodiment of a drilling tool according to the invention;

Fig. 17 shows another embodiment of the milling tool of Fig. 13;

Fig. 18 shows another embodiment of a turning bar;

Fig. 19 shows another embodiment of a drilling tool.

DETAILED DESCRIPTION

The embodiment shown in Fig. 1 is a drill 10 having damping elements 18 according to the present invention comprising a drill body 11 as well as an outer cutting insert 12 situated at the periphery of the drill and an inner cutting insert 13 situated closer to the centre of the drill. The cutting inserts are preferably made of hard cemented carbide. The two cutting plates are situated in such a way at different radial distances from the drill axis A that their operating areas overlap each other. At the same time, said cutting plates are displaced about 180° in the periphery direction of the tool as shown in Fig. 7. The cutting plates 12 and 13 are, in a known way, for instance by means of a centre screw, fastened in a corresponding cutting pocket in the drill body 11. The drill body 11 has a substantially cylindrical basic shape and is made out of steel.

At the portion of the drill body 11, situated behind the cutting inserts, the drill body is provided with axially extending, radially outwardly open flutes 14 and 15, which in cross-

section are concavely bent and separately join to respective cutting plate 12 and 13. Said flutes 14, 15 are intended to serve as chip channels and the bars 16 and 17 having a cylindrical envelope surface are situated therebetween. In the embodiments illustrated in Figs. 1-6, said chip channels 14, 15 are helical. Alternatively, the chip channels 14, 15 may have a straight design or a combination thereof. A distance axially behind the cutting plates 12, 13, a damping element has in Fig. 1 been placed on the bar 16 in a corresponding recess. The damping element 18 may be composed of a material of another density than that of the drill body 11. Of importance is that the damping element 18 is arranged in its recess of the bar 16, such that during working, a relative movement of the element 18 and the drill body 11 is allowed, and that the connection of the damping element 18 is such that its envelope surface does not substantially prevent the desired penetration of a hole in the tool of the workpiece 3 in question.

The embodiment of Fig. 1 is such that the top surface of the damping element 18 becomes situated flush with and with the same shape as the adjacent outer surface of the drill body 11. The damping element 18 has a shape that entirely or partly corresponds with the shape of the outer envelope surface thereof. The damping element 18 may, for instance, be fastened at the drill shank 11 by means of one or several screws 19, 20. Alternatively, the damping element 18 may be connected to the drill body 11 by gluing or vulcanization. Alternatively, the damping elements 16 may be shaped such that they completely or partly are enclosed in a dove-tail shaped cavity formed in the top surface of the drill body. The drill body 11 is, at the axially rear portion thereof, in the common way formed with a rear sectional thickening in the shape of a conical portion 21 which transforms into a rear portion 22.

In the embodiment of Fig. 2, the damping element 18 has an axial, helical extension such that it constitutes a part of the bar 16, but at the same time is formed such that it does not reduce the size of the chip channel 14. Also in this case the damping element 18 may be connected to the drill body 11 by

means of one or several screws 19, 20, or be connnected to the drill body 11 by gluing or vulcanization.

In the same manner as regards the embodiment of Fig. 1, the top surface of the damping element 18 corresponds to the envelope surface of the bar 16. It is not necessary that the form of the damping element 18 completely connects to the outer shape of the bar 16. On the contrary, the damping element 18 may e.g. be somewhat recessed in a corresponding recess in the bar 16. In the embodiment according to Fig. 3A, the damping element 18 extends completely to the front surface of the drill body.

In the embodiments of Figs. 4-5, alternative embodiments in which the damping element of Fig. 4 has the shape of a plate 18a received in a recess in one of the flutes 14 such that its surface corresponds to that of the boundary surface of the flute. The damping elements 18a in Fig. 5 have the shape of plates, recessed in the circumferential direction of the envelope surface of the bars. The damping elements have a convex envelope surface, substantially corresponding to the envelope surface of the bars.

In the embodiment of Fig. 6-7, the elements 18b have the shape of a pin or a tube, fastened in corresponding cavities in the drill body 11 by gluing or vulcanization. Alternatively, a stop member is introduced into the cavity, the stop member preventing the element 18 from starting out of the cavity, while simultaneously allowing the element to move inside the cavity.

Figs. 3B-3C show screwed-on damping elements, the screws 19, 20 being connected to the drill body, while simultaneously allowing a relative movement of the damping element 18 and the drill body 11, respectively.

The cavities adapted to receive the pins 18b may e.g. be the front end of cooling channels arranged in the tool. Between the damping element 18 and the tool body, there may be present a material of e.g. elastomer, polymer, crude rubber or a glue

compound and a sealing compound. Also combinations of these materials are possible.

In the embodiment according to Figs. 8-9, the damping elements have been given the shape of cylindrical elements 18c, connected inside radial bores 23a, 23b by means of gluing, vulcanization or the like. Alternatively, connection is performed by means of peg devices along or across the element. The peg devices may comprise one or several, completely or partially penetrating pegs.

In the embodiment of Fig. 10, the damping elements have been given the shape of straight cylindrical, tubular pins 18d, received in bores that extend conically outwards in the front portion of the drill bars 16, 17. The tube pins 18d are then received such that they become recessed a distance from the front surface of the drill body, as is apparent from Fig. 10. Alternatively, e.g. a stop member is introduced in the recess, the stop member preventing the element 18 from starting out from the cavity, but at the same time allowing the element to move inside the recess.

In the embodiment according to Figs. 11A-11B, the damping element 18 has been given the shape of a partly cylindrical wall element, which encloses the axial front portion of the flute 15. The design is then such that the axial extension of the element 18 is finished a distance axially behind the insert pocket that receives the inner cutting insert 13. Alternatively, the element 18 may extend all the way to the front surface of the drill.

In the embodiment according to Figs. 12A-12B, the damping element 18 is connected to the drill body by means of screws 19, 20, in accordance with the manner described above.

In Fig. 13 is generally shown a milling body 26 with six insert sites 27. In each insert site a mounted cutting insert 28 and a shim 29 are provided which have been tightened in the insert site by means of a locking screw 30. The cutting inserts are in this case functionally inclined with a positive axial angle in the milling

body. In the direction of rotation there is in front of each insert provided a milled chip pocket 31. On the envelope surface of the milling body 26, a number of damping elements 18 have been attached by means of screw elements 32, 33, allowing relative movement of the elements 18 and the milling body 26 during the milling operation. As can be seen, the elements 18 are attached to the milling body in positions at an axial distance behind the positions of the cutting inserts. The damping elements 18 constitute discontinuously formed sections of an annular damping element.

In the embodiment shown in Fig. 14, for internal turning, the tool is composed of a bar 34 and a holder body in the form of a cutting head 35 arranged at the front end of the bar. The cutting head 35 is adjustable in a radial direction and is in the embodiment shown provided with a dove-tail slot 36 encompassing a corresponding tap or tongue 37 of the bar 34. The cutting head is provided with a cutting insert 38, fastened by means of a clamping element 39. The damping element 18 is attached to the exterior surface of the cutting head or is located therein (cf. Figs. 6-10). The damping body may alternatively comprise sand, granulate or a plurality of small bodies being allowed, respectively, to perform a movement relative to the tool. The damping body, or the sand or granulate may completely or partially be surrounded by a rigid, liquid or gaseous medium.

Fig. 15A shows a drill body 11 provided with a radially arranged screw 40. A circular cylindrical surface 42 and a flange having an annular, axially directed surface 44, constitute a seat for an annularly formed damping element 18 (see Fig. 15B). The screw is fastened relative to the drill body, but allows the damping element to perform a movement relative to the drill body.

Fig. 16A shows a drill body 11 provided with a semi-annular damping element 18e comprising two radially arranged screws 40.

Fig. 16B shows half the damping element 18e provided with a radially directed protrusion 44 adapted to be introduced in a corresponding recess or through-hole in the drill body. The

protrusion 44 is preferably arranged centrally between the screws 40.

Fig. 16C shows the drill body 11 including the other half of the damping element 18f, together forming an annular damping element 18. Also the half 18f has a protrusion corresponding to be introduced in a thereto corresponding recess or a through-hole 46. When both halves are put in place, they are connected relative to each other by means of the screws 40. The damping element is, however, allowed to perform a movement relative to the drill body, owing to the fact that the protrusion 44 is smaller than the recess or through-hole 46, thus allowing a certain play.

The damping element 18, 18e, 18f, shown in Figs. 15A-15B and 16A-16C, may of course be disconnectably arranged at the drill body 11, however in such a way that a movement relative to the drill body is allowed. In this case the screw or screws 40 are substituted for e.g. a rivet, a glue joint or vulcanization.

Of course, the damping element 18 may comprise more parts than two, as shown in Figs. 16A-16C.

Fig. 17 shows the milling body 26 according to Fig. 13, however with an annular damping element 18 attached to the milling body 26 by means of screws 32, allowing a radial play of the thread in relation to the thread of the mounting hole in the milling body 26, such that the desired relative movement of the damping element 18 and the milling body 26 is achieved.

Fig. 18 shows a turning bar corresponding to the one shown in Fig. 14, however with the difference that the damping element 18 has an annular shape and is arranged about the envelope surface of the cutting head 35. The damping element 18 is arranged in a manner corresponding to the discussion in connection with Fig. 17, such that the relative movement of the cutting head 35 and the damping element 18 is achieved.

Fig. 19 shows a drill tool of the kind shown in Fig. 15B, however with the difference that an exchange module 50 is disconnectably attached to the drill body 11, i.e. the exchange module 50 cannot perform a movement relative to the drill body 11. The exchange module is provided with one or a plurality of damping elements 18. In accordance with the invention, there are provided a set of exchange modules 50 with different radial extension and/or different inner diameters for different standard sizes of drill tools.

Furthermore, the exchange modules are provided with different number of damping elements 11 and different dimensions thereof, respectively, for achieving different degrees of damping and/or damping frequencies.

The drill bodies shown in Figs. 1-12 and 14-16 may alternatively comprise an end mill, that also have an elongated circular cylindrical basic shape.

Of course, within the scope of the invention, the position of the damping element or damping elements 18 may vary on or inside the milling body, the drill body and the turning bar, respectively.

CLAIMS

1. A tool for chip removal of metallic materials, comprising a holder body (11, 26, 35), supporting at least one cutting insert for active milling of a workpiece, wherein the holder body (11) is provided with at least one damping element (18) of another or the same material as the holder body (11), **characterized** in that
   - the tool has in its front end a portion provided with a cutting insert,
   - the damping element (18) and the holder body (11, 26, 35) are arranged in relation to each other such that, during machining, a relative movement of the holder body and the damping element is allowed.

2. A tool according to claim 1, **characterized** in that, in the space between the damping element (18) and the holder body (11), a joint or a border layer is provided such that a relative movement is allowed of the holder body and the damping element.

3. A tool according to claim 1, **characterized** in that the tool is shaped as an elongated drill tool comprising a drill body (11) with at least one cutting insert (12, 13) and a number of cooling channels inside each of which one or several tubes (18a) or pins (18b) are arranged.

4. A tool according to claim 1, **characterized** in that it comprises a drill body (11) with one or more cutting inserts (12, 13) located in its front end, wherein the envelope surface is provided with a recess in which a damping element (18) is arranged such that its envelope surface substantially does not prevent the desired penetration of the tool in a generated hole in the workpiece in question.

5. A tool according to claim 1, comprising a drill body (11) provided in its front end with cutting inserts (12, 13) and axially extending flutes (14, 15) between which bars (16, 17) are formed, wherein the damping element (18, 18a) is

shaped and connected to the drill such that it forms part of one of the bars (16) and at the same time constitutes part of the boundary surface of the flute.

6. A tool according to claim 1 or 2, comprising a drill body (11) provided in its front end with cutting inserts (12, 13) and in the drill body with radially, axially or in any other way directed flutes (14, 15), wherein damping elements in the form of pins (18b) or tubes (18a) are received in corresponding cavities in the drill body.

7. A tool according to claim 1, **characterized** in that it has the shape of a tool body (26) mounted with cutting edges, wherein the tool body are adapted to have one or more damping elements (18) arranged inside or on the surface of the tool body.

8. A tool according to claim **7**, **characterized** in that the damping elements are arranged at the tool body (26) at positions a distance axially behind the positions of the cutting inserts (28).

9. A tool according to claim 1, **characterized** in that it is shaped as a drill body provided in its front end with cutting inserts (12, 13) and flutes (14) formed along the holder body, wherein the damping element has been shaped as a part-cylindrical wall element (18), enclosing an axial portion of the flute (15).

10. A tool according to claim 1, **characterized** in that it is shaped as a drill body provided in its front end with cutting inserts (12, 13), wherein the damping element is shaped as an annular member (18), releasably or non-releasably connected to the holder body.

11. A tool according to claim 1, **characterized** in that it is shaped as a drill body provided in its front end with cutting inserts (12, 13) and at least one along the drill shaft arranged flute (14) from the front end,

wherein the annularly formed damping element (18) is arranged at the drill shaft without substantially penetrating said flute.

12. A tool according to anyone of claims 1-11, **characterized** in that the damping element comprises sand, granulate or a plurality of small bodies being allowed to perform a relative movement.

13. A damping device adapted to be arranged at a tool with a holder body provided in its front end with cutting inserts (12, 13), **characterized** in that the damping device is shaped as an annular member (18), releasably or non-releasably connected to the holder body.

14. A damping device according to claim 13, **characterized** in that it comprises at least two sections (18e, 18f) that in a connected state form said annular member.

15. A damping device according to claim 13, **characterized** in that it comprises a single annular damping element.

16. A damping device according to anyone of claims 13-15, **characterized** in that it comprises sand, granulate or a plurality of small bodies allowed to perform a relative movement.

17. A set of parts, comprising a plurality of annular exchange modules (50), each of which being provided with at least one damping device (11), wherein said exchange modules are adapted to fit holder bodies of standard dimension.

Fig. 1

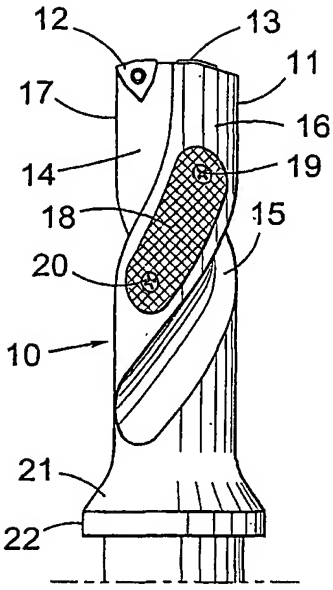


Fig. 2

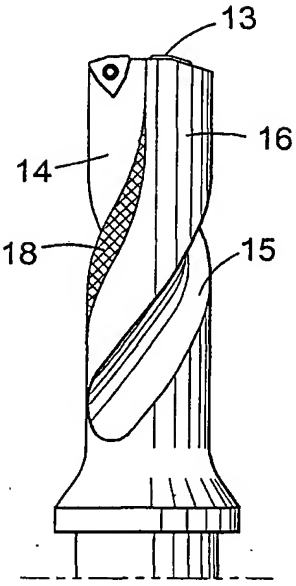


Fig. 3A

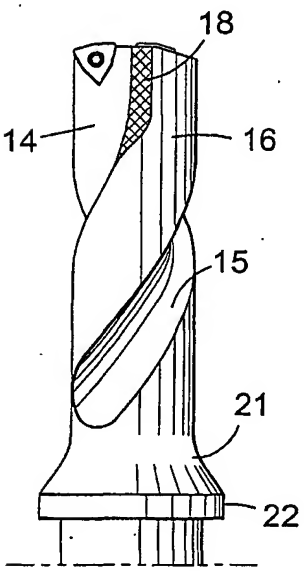


Fig. 3B

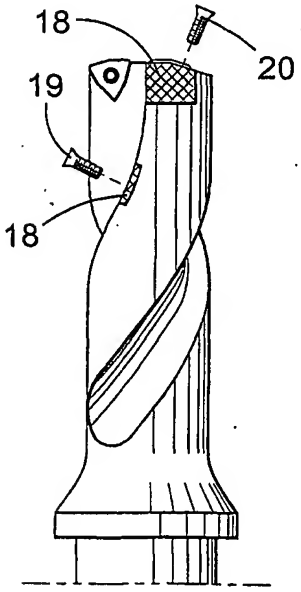


Fig. 3C

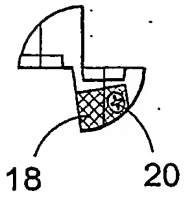


Fig. 4

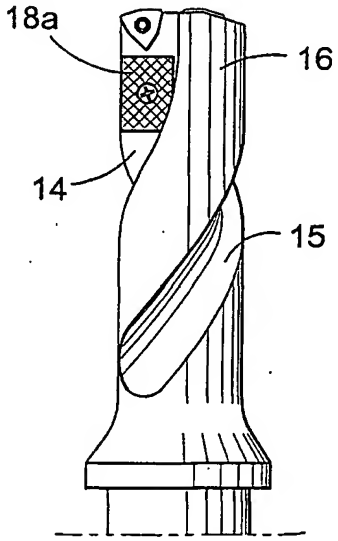


Fig. 5

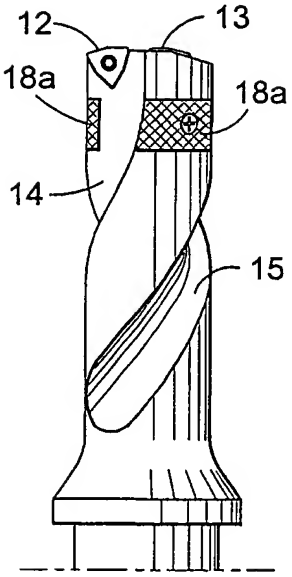


Fig. 6

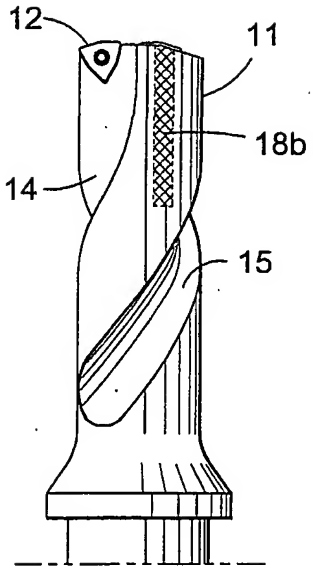


Fig. 7

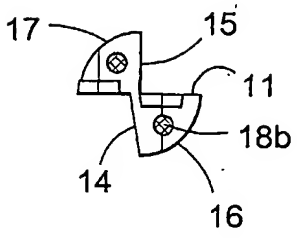


Fig. 8

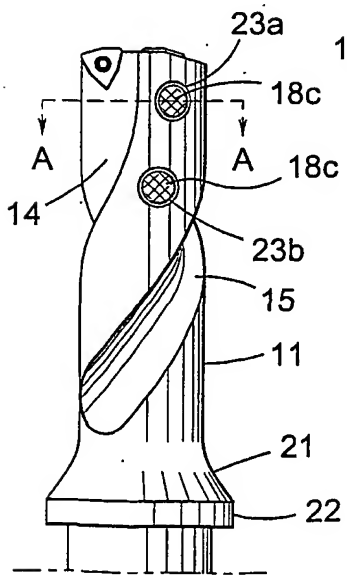


Fig. 9

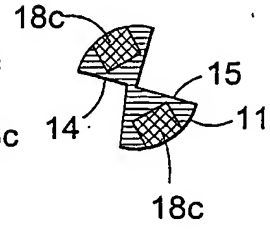


Fig. 10

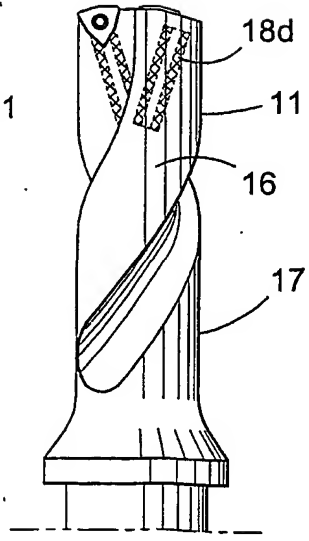


Fig. 11A

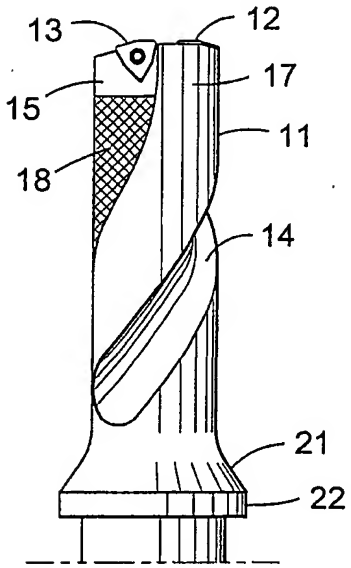


Fig. 11B

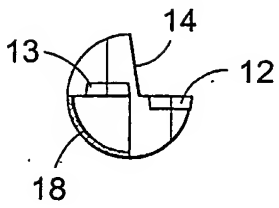


Fig. 12A

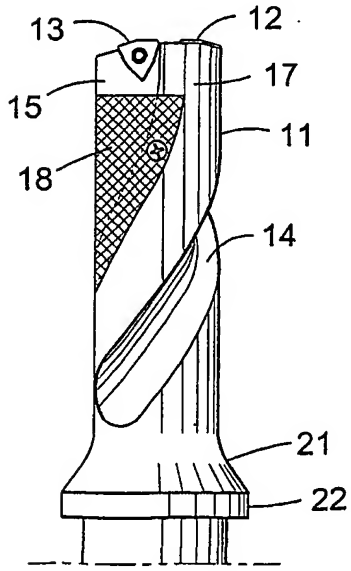


Fig. 12B

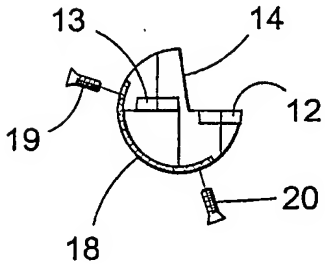


Fig. 13

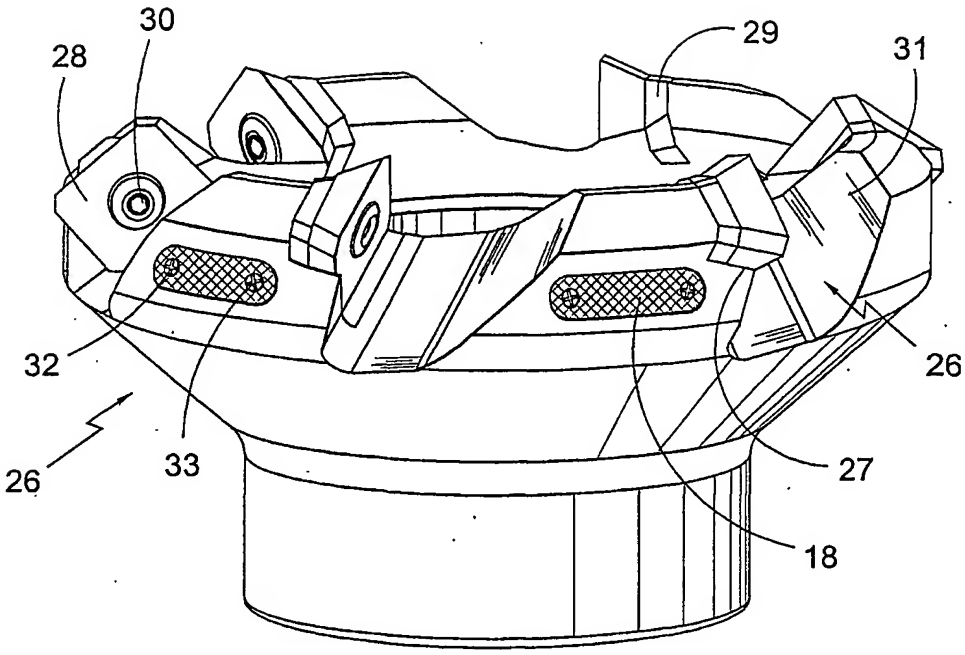
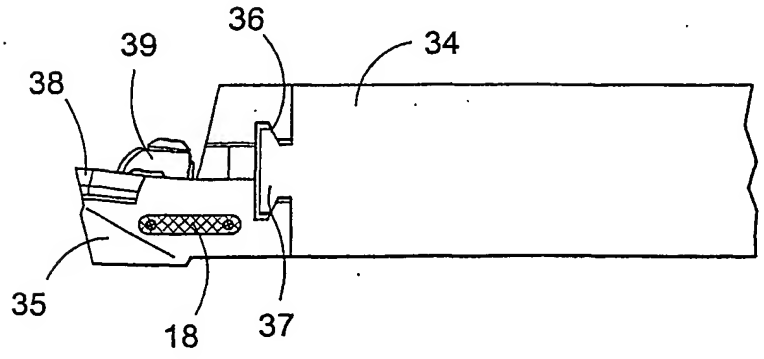


Fig. 14



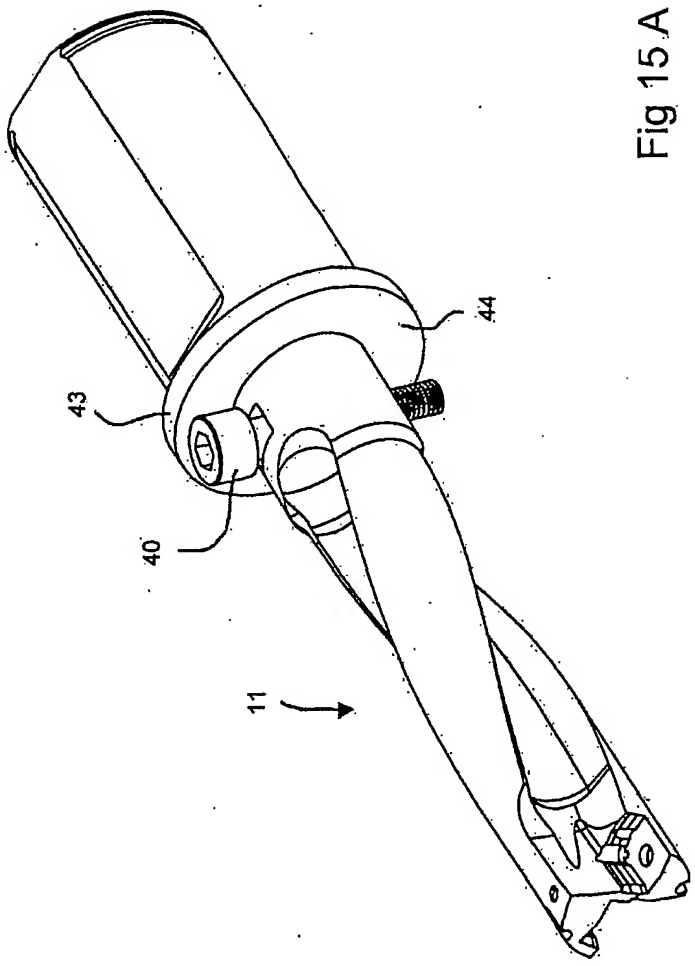


Fig 15 A

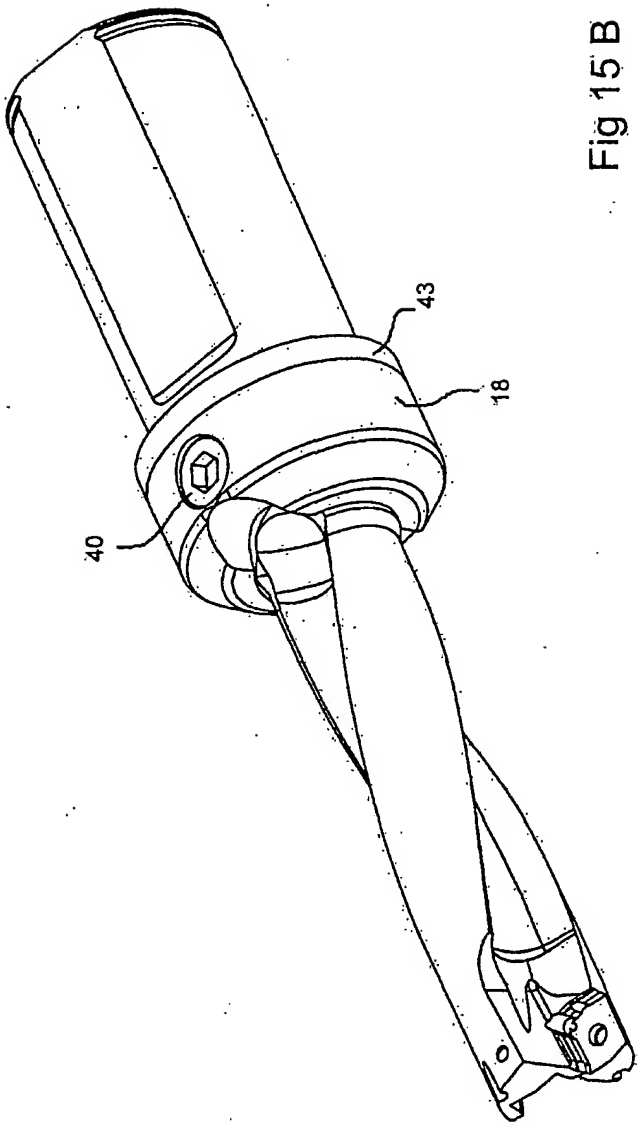


Fig 15 B

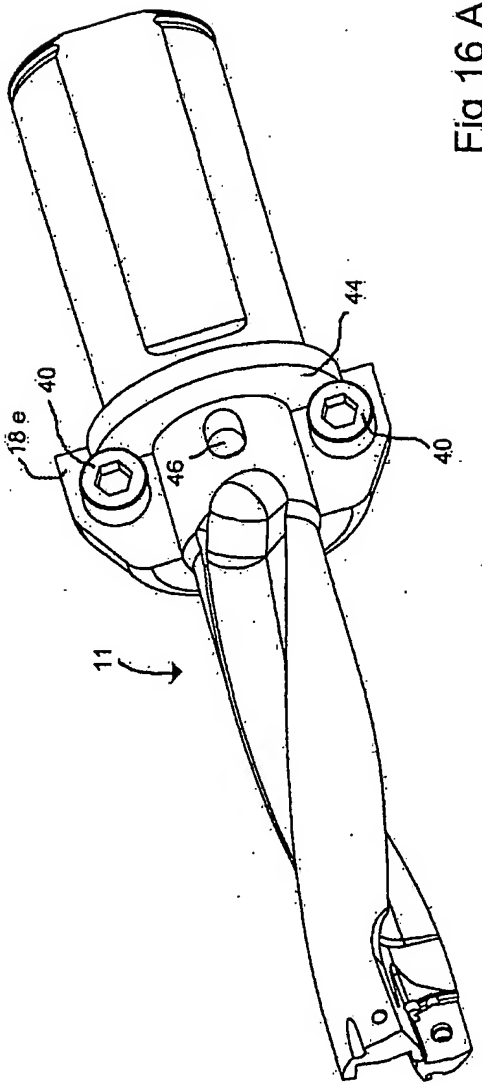


Fig 16 A

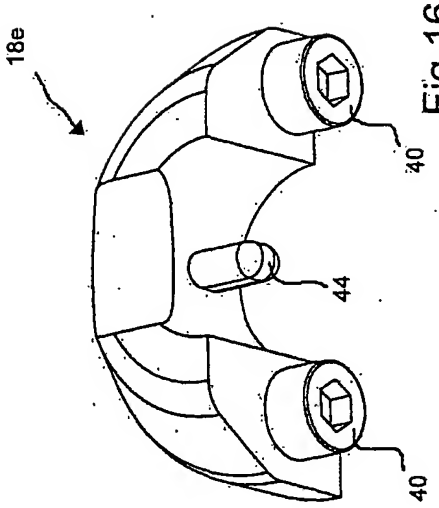


Fig 16 B

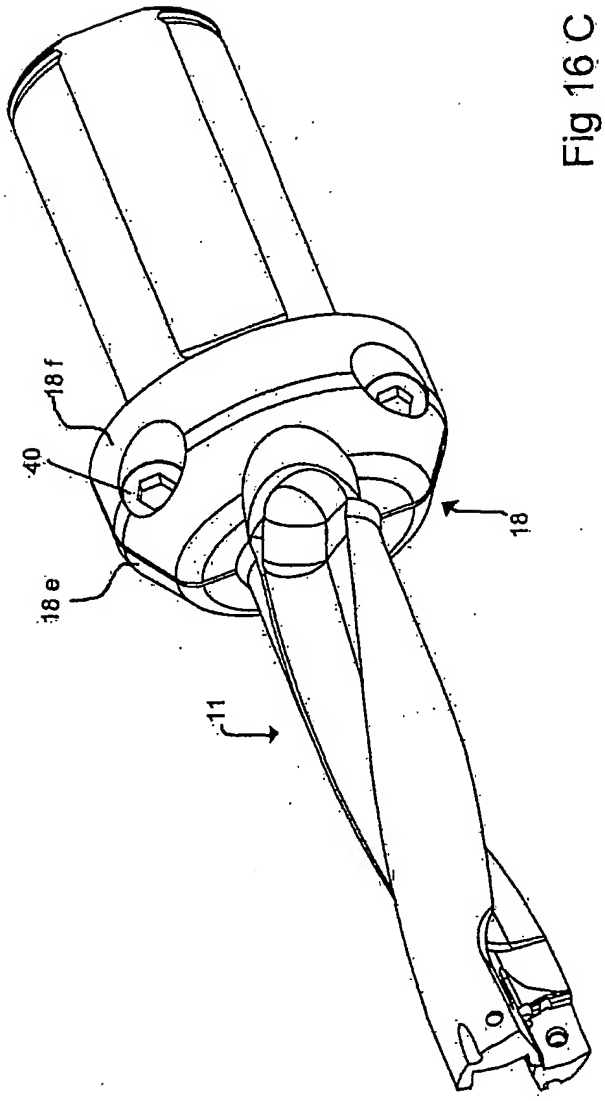


Fig 16 C

Fig. 17

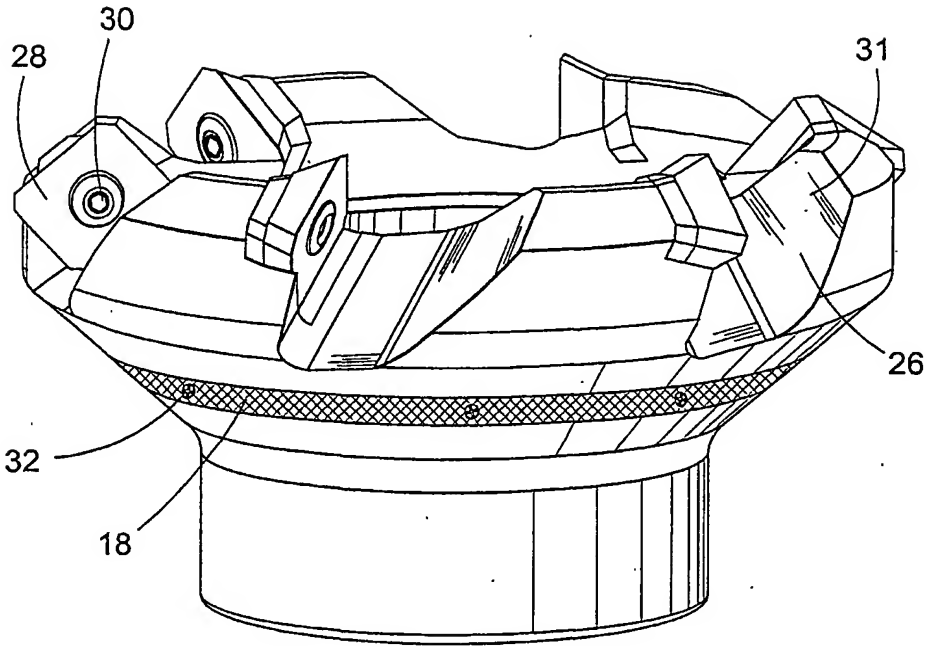
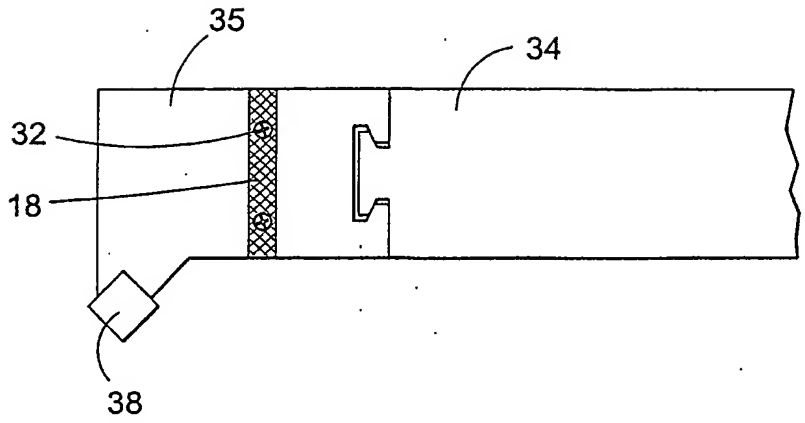


Fig. 18



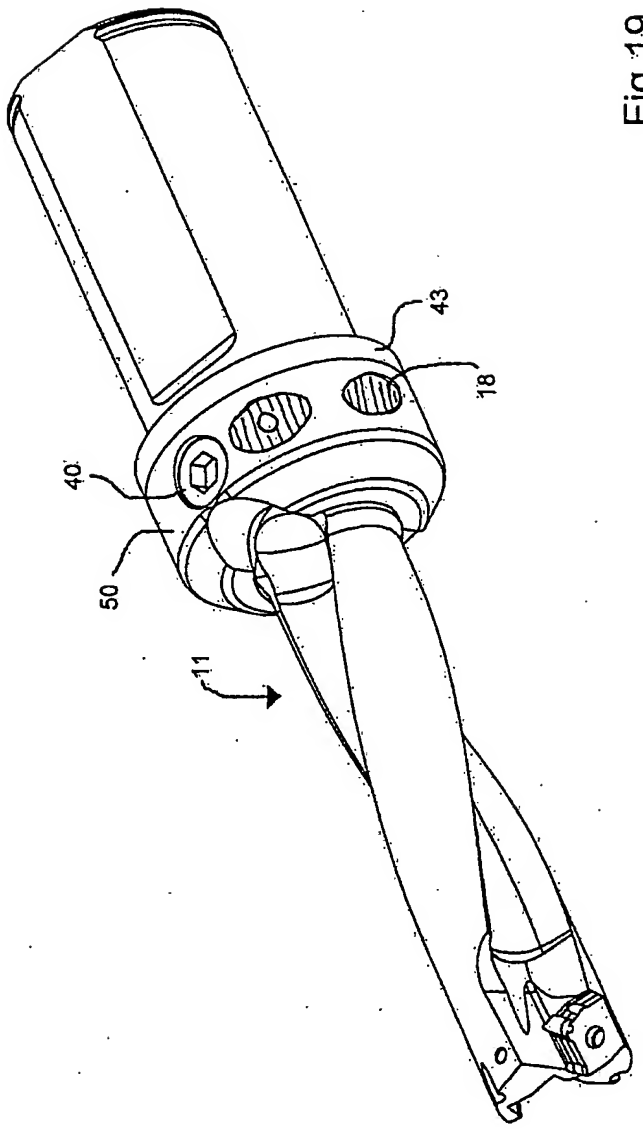


Fig 19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/02691

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B23B 51/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B23B, B23C, B23Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	SE 468930 B (SANDVIK AB), 19 April 1993 (19.04.93), figures 1,2, claims 1-10, abstract	1-2,7-8
A	figures 1,2, claims 1-10, abstract	3-6,9-16
	--	
Y	US 5372548 A (WILLIAM I. WOHLFELD), 13 December 1994 (13.12.94), figures 1-3, abstract	1-2,7-8
A	figures 1-3, abstract	3-6,9-16
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 March 2002	22 -03- 2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Fredrik Strand/MP Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/02691

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0090929 A2 (TBT TIEFBOHRTECHNIK GMBH UND CO. KG.), 12 October 1983 (12.10.83), figures 1-4, claim 1, abstract	13-15
Y	figures 1-4, claim 1, abstract	16
A	figures 1-4, claim 1, abstract	1-12
	--	
Y	WPI/Derwent's abstract , Accession Number 1993-092183, week199311, ABSTRACT OF SU 1726148 A1 (UNIV LUMUMBA), 15 April 1992 (15.04.92)	16
A		1-5
	--	
X	US 4591009 A (FREDERIC E. MARCEL ET AL), 27 May 1986 (27.05.86), figure 1, claim 1, abstract	13-15
A		1-12,16
	--	
E,X	WO 0198008 A1 (SANDVIK AKTIEBOLAG), 27 December 2001 (27.12.01), figures 1,2,10,11, claim 1, abstract	1-2,7-8, 13-16
E,A	figures 1,2,10,11, claim 1, abstract	3-6,9-12
	--	
A	US 6076999 A (ANNA HEDBERG ET AL), 20 June 2000 (20.06.00), figures 2,4, claim 1, abstract	1-16
	--	
A	DE 19948891 A1 (BOEHRINGER WERKZEUGMASCHINEN GMBH), 19 April 2001 (19.04.01), figures 1-3g, claim 1, abstract	1-16
	--	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/Se01/02691

Box I **Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 17
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

See extra sheet.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II **Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee. this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant. this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE01/02691

Box I

The claim is directed to set of parts comprising a plurality of annular exchange modules with at least one damping device. The exchange modules are adapted to fit holder bodies of standard dimension.
The claim is unclear and unduly wide. The technical features can not be identified. A meaningful search can not be made. See International Search Guidelines; III-3.7 and VIII-2.4.

Box II.

Lack of unity

The separate inventions are:

1. Claims 1-12 are directed to a tool for chip removal machining of metallic materials provided with a cutting insert and a damping element arranged so that relative movement is allowed between the element and the tool holder.

2. Claims 13-16 are directed to a damping device with annular shape.

The above groups of inventions do not satisfy the requirements of unity of invention. The groups of inventions are not so linked as to form a single general inventive concept (PCT Rule 13.1 and 13.2).
The "special technical features" in group one relate to a tool for chip removal machining provided with a cutting insert and a damping element.
The "special technical features" in group two relate to a damping device with annular shape.

There is no technical relationship among these inventions involving one or more of the same or corresponding technical features.

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/01/02

International application No.
PCT/SE 01/02691

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 468930 B	19/04/93	SE 8902081 A	10/12/90
US 5372548 A	13/12/94	GB 2295630 A,B	05/06/96
		GB 9424231 D	00/00/00
EP 0090929 A2	12/10/83	SE 0090929 T3	
		AT 28990 T	15/09/87
		DE 3209985 A,C	17/11/83
		DE 3373066 D	00/00/00
US 4591009 A	27/05/86	AT 48783 T	15/01/90
		AU 567589 B	26/11/87
		AU 3427984 A	02/05/85
		CA 1235074 A	12/04/88
		DE 3480772 D	00/00/00
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		ES 282200 U,Y	01/04/85
		FR 2553697 A,B	26/04/85
		JP 60133193 A	16/07/85
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		SE 0002294 A	21/12/01
US 6076999 A	20/06/00	EP 0958082 A	24/11/99
		JP 2001505133 T	17/04/01
		SE 511395 C	20/09/99
		SE 9602727 A	09/01/98
		WO 9801250 A	15/01/98
		SE 508988 C	23/11/98
		SE 9701232 A	05/10/98
DE 19948891 A1	19/04/01	WO 0126857 A	19/04/01